

Earth Science

Rockhounds' NATIONAL Magazine



Here is "Mr. Geology" at Iowa State College with his favorite glacial erratic. "If you want to pass out honors with it," Dr. Gwynne insisted, "remember where we got our subsoil! Why not honor the glacier?" (See page 9.)

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July-August, 1957

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EDITOR'S MEMO PAD

WHAT to put in a magazine? This is the very immediate problem of every editor. Naturally he realizes he has all sorts of readers, who also have all kinds of interests—some critical and others only casual. It is certainly the desire of every editor to serve informatively as large a number of his readers as is possible, and therefore he gives this matter much thought and study.

What the "policy" of the magazine shall be, is a matter that must be determined by its promoters, keeping ever in mind both its objectives and limitations as well. The name of our magazine, *EARTH SCIENCE*, is certainly indicative of its objective. *Earth Science* in itself is so broad a subject that almost anything of a scientific nature pertaining to the earth might possibly well come into its category. Even weather, climate, geography and implied human relationships might be legitimate topics for discussion. But obviously one cannot in any magazine be it large or small cover the entire "waterfront" without spreading the effort out much too thin, thus definitely defeating or endangering the entire purpose of its publication.

After an objective has once been established, it must then be the purpose of the editor to determine how this objective may be best served, and how the type, quantity and style of the material to be published in so doing may properly be selected. Here, the editor it seems must develop what might be the equivalent of the so called "sixth sense," for as a rule he has little or no direct contact with his readers, except for an occasional letter that may drift in, usually with a subscription or renewal.

This job may perhaps best be done by his building up, in his own mind at least, a cross-section of the total reader interest of the subscribers. While *EARTH SCIENCE* might be classed by some as strictly a hobby magazine (being the official organ of the Midwest Federation, a hobby organization), we feel that it is definitely much more than that, since half our readers are non-club members. In fact we have on our subscription list people from almost every walk of life, and also from all educational strata, from grade school students to many with doctorate degrees. Their interests therefore must range through the entire gamut of *Earth Science* topics from the simplest rockhounding, collecting and lapidary work, and up through the highest type of research and study.

With this in view it will be noted that in almost every issue there may be found at least one or more scholarly articles, such as for example the present three part series on "diatones" by Bernard W. Powell, which no doubt is one of the very best papers ever written upon this subject, regardless of where or by whom it may have been published, it being not only very readable and interesting but also authoritative as well. Then you will also find in the same issue other articles of a much simpler nature, designed to serve the beginner or more casual reader, who may be just as interested and eager

to learn though not strictly of the scholarly type.

Now by this time no doubt you may be wondering just what is the purpose of all this self appraisal, and here it is in a "nut-shell." Naturally, we should like to know if you are finding something of interest in each issue of the magazine. Is the subject matter sufficiently varied? Do you like short newsy items, or longer ones of educational value, or both? In other words, what do you like about *EARTH SCIENCE*? And of course your dislikes or criticisms will be equally welcome. We are striving to make it ever more to your liking, and you can help us do so in this manner. Thanks!

*

Beg Pardon. In some unexplainable manner the captions for the pictures on pages 16 and 17 of our last issue showing "Doc" Hoff with his oreodont skull, and Harry Witmer with his fossils, became interchanged. We are of course sorry this occurred, but we are sure that neither of these gentlemen will be "sore" for having been taken one for the other. We do feel it our duty always to do the very best we can to "keep history straight."

Also, it has been called to our attention that the article in our recent issue relating some of the facts concerning the organization of *ESCONI* may have left the impression that employees of the "Hawthorne Plant" were almost solely responsible for the inception and maintenance of this very fine club. This was not the intent of the article, as it is indeed well known that the great majority of the more than 400 members of *ESCONI* at present represent more than ten or a dozen of the important industries of the Chicago suburban area. We are only too glad to give credit where credit is due.

*

The Centennial Celebration of the Chicago Academy of Sciences, on May 15 was a noteworthy occasion for the scientists of the Chicago area. We are particularly concerned with the event due to the fact that the Marquette Geologists Association which is an affiliate of the Academy and holds regular meetings in the auditorium, was one of the three founding members of the Midwest Federation; and also that our managing editor, Mr. Hiram L. Kennicott, Sr., a trustee of the Academy and a relative of Robert Kennicott, naturalist and founder, gave a historical sketch of the Academy at the commemorative ceremonies. Dr. Alexander Wetmore, ornithologist and paleontologist, who is emeritus secretary of the Smithsonian Institution, came from Washington to discuss "Natural History in the Atomic Age" on the occasion.

The Academy was founded in 1857 "for the increase and diffusion of scientific knowledge." Its collections were twice destroyed by fire, in 1866 and again in the Great Chicago fire of 1871. The present building in Lincoln Park was built in 1893-94, and is visited annually by thousands interested in viewing its exhibits and laboratories.

*

Our Soil Is Complex. We frequently hear the expression, "just plain dirt." No! It is not nearly so simple as this. Everyone is aware, of course, that our soil is derived from disintegrated rocks and minerals, and all are familiar with more common types of soil that we hear mentioned in our everyday conversations—clay, sandy, loam, alluvial, red and even sour soil.

However, since there are almost innumerable species of minerals and rocks, which are of course mixtures of minerals, therefore there must be almost a like number of soils composed of combinations of the various types of their component minerals. Indeed, the experts of the U.S. Department of Agriculture have classified more than 3,000 soils in the United States, and have compiled maps showing their extent and location. It has been proven beyond doubt that types of soil ideal for certain individual crops may be almost entirely worthless for others. This, coupled with the factors of climate and rainfall, is the very reason for such diversified agriculture as we now find in this country.

Uranium Deposits may now be discovered by use of geochemistry, according to a dispatch from Spokane, Wash., to the *N.Y. Journal of Commerce*, which says: "Geiger counter wild-cating in uranium prospecting is a thing of the past, according to Geo-Resource Corp., a northwest mining firm which has announced a find of major underground uranium deposits in eastern Washington by the application of geochemistry."

In announcing the find, the first by this method, William D. Weaver, president, explained that deeply imbedded uranium deposits, which are beyond the range of the Geiger counter, are continually being dissolved by underground water and springs that carry the uranium out and deposit it in small traces over much of the earth's surface. Through extensive geological survey and geochemical testings, the tracings can be followed back to the heart of the underground deposits.

The company's chief geologist, F. O. Jones, said that "without question the new geochemical method of uranium prospecting will make possible the discovery of ore deposits of greater magnitude than any so far known."

Be this as it may, while it seems that somebody is always taking the fun out of life, we are still of the opinion that the boys out roughing it with the Geiger counters will yet turn up many valuable uranium prospects. More power to them, may they prosper and their number increase.

The 1957 edition of *"Kansas Rocks and Minerals"* is now being distributed by the State Geological Survey, University of Kansas, at Lawrence.

This booklet includes a section on the geologic history of Kansas, illustrated by a geologic timetable and rock chart, a generalized geologic map, and a cross section of Kansas rocks; a discussion

of the types of rocks found in Kansas; detailed descriptions of 34 minerals, and a county index, as well as a general index. Copies may be obtained from the "Survey" upon request for a mailing charge of 5 cents each.

LETTERS TO EDITOR

(Yes, we do appreciate your comments. It is the only way we have of knowing definitely when we are on the right track.)

Hartford, Mich.

Please renew my subscription for EARTH SCIENCE for three years. Enclosed find my money order for \$5.00. My family and I have enjoyed every issue of your fine magazine, and look forward to the coming of each new copy. Keep up this good work.

—ELSIE LEPTICH

Willits, Calif.
May 23, 1957.

Enclosed is \$2.00 for my subscription. Your EARTH SCIENCE magazine is a publication with magic in it.

At a recent rock show I bought a year old copy of EARTH SCIENCE, May-June, 1956, and right on the very first page was information I had been seeking for three months. "Man and the Mastodon in Missouri" not only answered my questions but amazed me as well.

I could hardly imagine a collection of six hundred Mastodon teeth, especially after seeing the set of dentures from the one poor old Mastodon found here in Willits, Mendocino County, Calif., twenty-five years ago.

Being interested in fossils and trying to build up a "below the surface" picture of our unmapped Mendocino county, I contacted Mr. Charlie Van Bebber, the old timer, who had found the Willits Mastodon.

"Yes, ma'am," says Charlie who had been fishing the streams and roaming the hills of Mendocino county for fifty years, "I did find that Mastodon standing right up in that clay bank. That old reddish blue clay that you see so much of around here. I brought the teeth, jaw bone and a tusk home and let the girl take one of the teeth to school. When I got home from work that night I thought there had been a tragedy. There were cars and people all over the place. But all it was about were those big teeth I'd found. My, the excitement. Some people from the university came; and the fellows from the museum wanted to take the skeleton; but I wouldn't let them. Especially after they told me what to do to preserve it. Bah!

"First, I was to make a thick flour paste and cover the teeth and bones. Second, I was to wrap it all in cheese cloth, and lastly, now this will get you, I was to wrap it all up tight in a gunny-sack and store in a dark place! Now, what fun would there be in that? No one could see them. What would be the use of having a

prehistoric animal? I told them no, and I didn't tell them where I found it, either, because I'm going back one of these days and look for another one."

Charlie was holding one of the teeth in his hands, turning it over and over, staring moodily at the big box of crumpled bone and tusk in front of him.

Suddenly he chuckled and looked at me with a twinkle in his eyes, "Marie, wouldn't one of those dentist guys have a big job with these!"

He told me he had the papers the university had sent him but he didn't know where they were because things got kind of mislaid after twenty-five years in the same house. He then put the big tooth gently back in the box and very carefully stored it in his pantry, right handy to show the next interested person who came to see them.

Not many people know about the Willits Mastodon. The story has developed into myth more than fact. Some kind of pre-historic animal, they say. Must have been an elephant that escaped from a circus, others say.

I was excited. I wanted to go Mastodon hunting. And Charlie did not give me many directions. He did give me some of the crumpled bone and shale from the bottom of the box. The mice had been in it, too.

I placed my small ration of Mastodon under my microscope, and said to my husband, "I believe I can find that clay bank!"

Under the microscope the bone showed veins of blue crocidolite, bits of clay iron-stone, blue shale, red sandstone, stains of manganese, and traces of fossil organic matter.

We grabbed our hammers, loaded the twins in the wagon, and were off. I had pin-pointed on my contour map the only big bend in the most fishable creek, where a wash-out had taken place years ago. Highways and land marks have changed; but those creeks draining through that sticky blue shale would have to be blasted to change their courses.

We arrived at the spot, and, with difficulty, I will admit, because the twenty-five-pound two-and-one-half-year-old-girls are a heavy hip load; clambered down the bank, and scanned the area for tell-tale signs that I had seen under the microscope.

This is what we found.

Reddish-blue shale in an up-thrust fault. Sandstone concretions. Bits of bone that were so mineralized that little calcareous matter was left. Fibrous blue crocidolite was speckled here and there on one piece of jaw-bone that had held a tooth long ago, our time.

There were huge flats of coprolite that showed those Mastodons really used their teeth. There were "rocks" with hide on them. They looked like old seasoned pieces of leather. They compared with the bits of bone of the original Mastodon, with the same tell-tale minerals in them.

One section of bank looked most interesting. Just as if another sixteen-foot Mastodon was standing there. But, it was getting dark; the twins were muddy and hungry, and we had all

we could carry. We plodded back to the car with OUR Mastodon findings. I had to stoop once on the way up the bank to pick a Johnny-Jump-Up who had thought it was spring. And any rockhound knows that stooping, once you are loaded with rock, takes supreme effort.

Like Charlie, I'm going back some day and really find myself a Mastodon. Why? Charlie's find was enough to fill in my "under the surface" picture for that one place. It's a fever. A fossil fever. I've got it. Like the time I dug up a man's clothesline pole he had just set, because he had found what looked like a clam shell, he said, while digging the hole.

I'll find a Mastodon one of these days. There must have been more than one Mastodon fall in that Pleistocene lake. It's a puzzle, though, because one mile north of the Mastodon find an eyeless skull of a deep sea creature of Pliocene times was found. And a layer above the eyeless skull are Pleistocene non-marine Gastropod shells (*Amnicola longinqua*).

I haven't any letters to put after my name, like Doctor of Philosophy; but if digging and study and a sincere effort to develop this one little frontier in California will add anything to a better way of life for our children, then just call me Marie Van Cleemput, R.H., Rock Hound.

—MARIE VAN CLEEMPUT

* * *

AUTHORS

Richard F. Trump, Iowa State '36, teaches biology at Ames high school and does free lance writing as a side-line . . . Dr. Willard H. Parsony is professor of geology, at Wayne State University, Detroit. On a year's sabbatical leave, he is studying Hawaiian volcanoes, about which he will write for EARTH SCIENCE on his return . . . John F. Mibelle, Detroit educator, past president of the Midwest Federation and rockhound—extraordinary, has been a frequent and valued contributor to our columns . . . William H. (Bill) Allaway is a tower of strength in good undertakings, including rockhounding in general and EARTH SCIENCE magazine in particular.

—BEN HUR WILSON, Editor

BOOK REVIEWS

"GLACIAL AND PLEISTOCENE GEOLOGY," by Richard Foster Flint. John Wiley & Sons, Inc. N.Y. 553 pages, \$12.50

At last we have a book covering glacial and Pleistocene geology, which not only is thoroughly adequate for every need, but at the same time both readable and authoritative. The author, Dr. Richard Foster Flint, received his Ph.D. in geology from the University of Chicago in 1925, and since that year has been on the faculty of Yale University, where he is today professor of geology.

In collaboration with Dr. Chester R. Longwell, also on the faculty of Yale, he has published "Introduction to Physical Geology," which

has been called "the best of the introductory texts on the subject of geology today." Dr. Flint has served with the U.S. Geological Survey and with the geological surveys of several states in mapping and other projects.

In his present work the author reflects the unprecedented advances made in Pleistocene geology in recent years, and presents a new treatment of glaciology, designed to be more meaningful for the student pursuing the subject. There are up-to-date discussions of sea-floor stratigraphy, soils, frozen ground phenomena, and geochemical contributions to chronology and the measurement of temperatures. The work is especially well illustrated with pictures, diagrams, and charts, and the glacial maps appended will prove very helpful. A list of 866 reference titles is probably the most comprehensive yet published. No real student of Pleistocene geology can afford to be without this fine reference text in his library.

—B.H.W.

"TARGET: EARTH," by Allan O. Kelly and Frank Dachtel. Available from Target:Earth, Box 335, Carlsbad, Calif. \$5.00.

Of what is Earth a Target? Meteors, say the authors. But "target" connotes aim, and "aim" connotes intelligence. Howbeit, this book offers evidence that in the past our earth, accidentally or by Design, found itself in the path of traveling cosmic bodies several hundred miles in diameter. These were literally earth-shaking objects, not to be compared with the meteor which formed the Chubb crater in northern Quebec. Although the Chubb is the largest crater on our land surface known to be of meteoric origin, it was formed by a meteor presumed to be only about a mile in diameter. The early giants visualized by the authors are believed to have struck with such force as to send oceanic floods over the land and even to change the axis of the earth. The deep depressions they made are now covered by water. Even in the comparatively recent time of man's recorded history, the account of a great deluge is common to nearly all races, including the American Indian. The authors believe this universal deluge could only have been caused by such a tremendous shock as would have resulted from earth's collision with a rapidly moving object from outer space. The theme of the Hebrew account, that the deluge was God's means of destroying sinful man while saving one just man, is also found in the Chaldean and Greek accounts.

Geological evidence of jolting meteoric impacts, or cosmic collisions, include fossilized remains of plant life within the Arctic Circle, indicating that the Poles were not always at their present location; and witness "island arcs" such as the Aleutians and Marianas, the orientation of which suggests that they are parts of a mountainous ridge thrown up at one time around a meteoric crater. The frequency of volcanic action around island arcs is believed to be caused by the slow cooling and contraction of sub-oceanic pools of lava liquefied by the force of the meteoric impact. Many other phenomena are

cited by the authors in support of their theory. While the typography of the book is not of the best, this drawback is lost in the fascination of the subject matter.

First exploration of the Chubb crater, as recently as 1950, seems to have stimulated scientific interest in meteors. "Target: Earth" is provocative background reading for such articles as "The Lost Planet" by N. J. Berrill, of McGill University (*Atlantic Monthly*, June, 1957). Professor Berrill reports that about 2,000 fragments of what was once probably a fairly large planet have been seen circling their orbits between Mars and Jupiter. Why the planet burst asunder (or possibly never fused together), no one knows, but its fragments are thought to be the source of the meteors which have collided with our earth. The time of the major collisions, judging from the proportions of uranium, lead, and helium in the meteorites examined, was a few hundred million years ago, sometime during the great age of reptiles on the earth.

—M.G.C.

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Gwynne's Granite tells a lot about its own past. Differential weathering has left a prominent pattern of pink dikes. Cutting across one another, the dikes "date" a series of intrusions of hot magma into fissures that developed from shrinkage of the cooling granite. (See cover picture.)

Gift from the Glacier—"Gwynne's Granite"

by RICHARD F. TRUMP

WHEN GLACIERS inched their way down the North American continent, they left tracks to intrigue geologists. They gouged out the basins of lakes and enlarged the channels of rivers. And with the priceless deposit of drift, they left granite boulders, carried southward from the regions where the molten magma had cooled eons ago. Because they are out of place with the native shales, limestones and sandstones, such boulders are called *glacial erratics*.

By strange coincidence, one of the finest of the countless erratics to be seen in the midwest is an eight-ton boulder that was left on a creek bank near Ames, Ia.—almost at the back door of Iowa State College's geology department. Students know it as "Gwynne's Granite," in honor of Dr. Charles S. Gwynne, a member of the geology faculty for many years.

Why is one boulder better than another? Simply because it tells more about its own past. Gwynne's Granite has a lot to say!

No one knows just how long ago the ice began to melt and flow down the valley of Squaw Creek. Perhaps it was ten thousand years ago. But the glaciation was a recent event compared with the ancient origin of the boulder itself. Once a molten solution of minerals, it was part of a mass that solidified beneath the earth's surface. Cooling slowly, it developed a coarse-grained crystalline structure that included

quartz, feldspar, mica, and hornblende. The latter mineral is responsible for the boulder's dark color.

As the solidified mass cooled, shrinkage caused cracks and crevices. Then more magma, forced upward through the earth, intruded the crevices. With less of the dark hornblende and a greater percentage of pink feldspar, this material contrasts sharply with the remainder of the granite.

After rising slowly to the surface during a long period of uplift, the mass was exposed to weathering. Alternate freezing and thawing broke off chunks, roughing out the shape of Gwynne's Granite. Ages of wind and water have cut away the dark rock faster than the rock colored by the pink feldspar, leaving a prominent pattern of pink dikes exposed in relief. Gwynne believes this differential weathering occurred mostly before the boulder arrived in the Squaw Creek valley.

Because some of the dikes intersect and cut through others, it is clear that some are younger than others. You can "date" them in relation to each other as you would a series of criss-crossed car tracks on a dusty road.

While the exposure of the pink dikes is a most obvious characteristic of the granite, alert geology students are able to read much more history on its surface. From the assemblage of minerals, they know that it

is an igneous rock. It was born in heat. They can point out several fragments of dense black rock that had previously solidified and were engulfed by the hot magma. They can find a pattern of parallel scratches called "striae" on one of the dikes—a mark of glaciation when the boulder was still a part of the parent mass. And there are seven distinct dikes that can be numbered according to their age.

Most recent event in the erratic's history was another move—this time at the hand of man. With expansion of the campus, it appeared that the granite might be endangered by new road or buildings. So the eight-ton land-mark was transplanted to a safer spot on the campus lawn, near the geology laboratories.

An ardent admirer of the unique boulder, Dr. Gwynne had long argued that it should remain right where the glacier left it. "And if you want to pass out honors with it," he insisted, "remember where we got our subsoil! Why not honor the glacier?"

The answer is obvious to Gwynne's students. They would rather honor the man who taught them about glaciers.

SAPPHIRE HEAD OF JEFFERSON UNVEILED

A carving in sapphire of Thomas Jefferson's head, part of a million dollar collection, was unveiled at special ceremonies at his home—Monticello, Va., on the anniversary of his birth, April 13, 1743. (Illustration by courtesy of *Chicago Tribune*.)

The magnificently carved gem, about 3 inches high, is one of a series of four of "The Presidents in Sapphire." The other heads are those of George Washington, Abraham Lincoln, and Dwight D. Eisenhower. Each is valued at about \$250,000.

The Dwight D. Eisenhower bust, it will be remembered, was unveiled on September 27, 1955, in the foyer of the Shoreham Hotel, in Washington, in the presence of many visitors attending the convention of the Eastern Federation, includ-

ing the officers of the American and Eastern Federation as specially invited guests (See EARTH SCIENCE, Jan.-Feb., 1956.)

The recently completed carving of the third President of the United States is being presented to the people of the United States by the Kazanjian Foundation, a California non-profit corporation organized to take custody of the gems.

The valuable carvings were turned over to the foundation by James and Harry Kazanjian of Los Angeles, gem importers who came to this country from Armenia in 1912.



Their gift was in appreciation of the opportunity this nation gave them.

Superior Judge Jerold E. Weil, of Pasadena, president of the Kazanjian Foundation, spoke at the unveiling at Monticello. Among others present was Col. Randle B. Truett, chief historian for the national capital parks in Washington and treasurer of the foundation.

The head of Jefferson was carved over a period of more than a year by Harry B. Derian, Los Angeles artist. Technical advice was given by Lincoln Borglum, of Beeville, Tex., son of Gutzon Borglum, the Mount Rushmore sculptor.

— B.H.W.

Prospecting in the Canadian Eastern Arctic

by WILLARD H. PARSONS

IN THE LATE SPRING of 1956, I was asked to lead a small geological prospecting party into the Canadian Eastern Arctic as soon as weather would permit. Several hectic weeks in May were spent trying to find out what sort of conditions the party might expect, the equipment we should take with us and the best means of transportation to our destination, and in study of aerial photographs to plan our exploration. The experts in Ottawa advised us to travel before the "breakup" and so we rushed to be ready to leave from Churchill by the first week in June. But circumstances combined which caused us to postpone our expedition until after the ice was gone. In Churchill we found that greenhorns in Arctic adventure are advised against going in before break-up unless they have Eskimo guides. But, I'm getting ahead of the story.

The Canadian Eastern Arctic includes Labrador, both sides of Hudson Bay and the Arctic Islands, as opposed to the Western Arctic which lies well west of Hudson Bay and includes the Yellowknife and the Great Bear Lake regions over to the Alaskan border. In this belt, the ice finally melts from the lakes and from Hudson Bay late in June or early July, only to form again in September. The members of the Canadian Geological Survey as well as many explorers and prospectors start their "summer" season before the ice has melted; that is, before the "break-up". This takes place in late May or early June, depending on how far north one is going. At this time of year, the snow is fairly well melted, so that rocks are exposed but the thick lake ice is still strong enough for planes equipped with skis; lake ice reaches 10 to 12 feet in thickness. By going in before the "break-up" one can get in a 3 months' season before freezing sets in again in September.

Our party of three (two Wayne State University students, Tom Manley and Ed Gauthier, and myself) left Detroit on June 4 by air on a mad dash to get to the Arctic before the sun should weaken the ice. At Winnipeg the temperature was 85°; it was a typical hot summer's day on the plains. We enplaned again on Canadian Pacific Airlines for the 5 hour, 800 mile jump to Churchill. The first leg of this flight to The Pas is over the plains with their farms and wheat fields.

The Pas is the north limit of roads and lies in a region of forests and lakes. Here the railroad forks, one branch going north to the mining area of Flin Flon; the other northeast to Hudson Bay at Churchill. Even here, it was a warm spring day; the trees were green—no hint of the Arctic. Our plane resumed its northward flight and in a few minutes we saw rock outcrops. The Pas is near the southern edge of the Canadian Shield of pre-Cambrian rocks, hard rocks that stick up in low ridges through the glacial deposits. For awhile the scenery seemed to show only a jumble of lakes, light-green swamps, meandering streams and forests. But after an hour or so, we suddenly realized that an imperceptible change had taken place; the swamps and fields were no longer green but showed the brown of later winter. Looking ahead large white patches became visible; soon it became apparent that these were ice-covered lakes. The small lakes and rivers were free of ice, but lakes a mile or more in length still had a covering of ice. This latter was partly melted away from the shore and looked quite "decayed." Occasional white snow drifts became more numerous, contrasting with the dirty greyish or even yellowish-white of the lake ice. During the last hour of our trip the number of these ice-covered lakes increased rapidly until

even the small lakes and rivers were ice-covered and a great white expanse appeared on the horizon—icebound Hudson Bay! And so we landed at Churchill with the ground bare and the temperature a very chilly 35°, after the 85° at Winnipeg 5 hours earlier.

One lands on a military air strip of Fort Churchill. About 5,000 men including both Canadian and U. S. army and air force units are stationed here, engaged in various Arctic researches and in patrolling the Arctic and supervising the establishment of DEW (Delayed Early Warning) line radar stations far to the north. The Fort is largely post-war in construction and thus has a new, modern look in spite of its bleakness. There are no trees; no grass: just bare ground, rock and ice! The trim 2 and 3 story white buildings are lined up with the usual military precision on a bluff overlooking Hudson Bay.

The townsite of Churchill is 5 miles from the Fort on a long narrow point of land extending between the shore of Hudson Bay and the 2-mile-wide harbor of the Churchill River. The town impressed us as a miserable, dirty spot. There are about 5,000 inhabitants, of whom half are Indians. (No Eskimos surprisingly). Our hotel was a 2-story frame building with 20 rooms and only one bathroom; but at least it was warm. Now at last we realized we were on the edge of the Arctic. The wide Churchill River was still covered by very rough ice; and ice stretched out over Hudson Bay to the horizon with only a few breaks here and there. We watched seals playing among the ice floes off shore in Hudson Bay.

Here we spent 2 weeks really learning about the conditions we could expect to the north. We waited long enough, fortunately, to decide to postpone our trip for a month until all ice was gone and we could land on water in a pontoon plane. During those 2 weeks we explored Churchill. The land is flat with a few low quartzite ridges separating the muskeg

(swamps). The Canadian National Railway comes into Churchill. The usual bulky railroad buildings give the town on a sunny day an appearance not unlike a barren, treeless North Dakota village. The houses in Churchill are small frame structures, many needing paint; trash is dumped in the back yards to be shovelled up once a year. There are no gardens but many dogs. All roads are gravel and either muddy or dusty. There are a surprising number of cars, all brought in on the long single track railroad which is the one connecting link with civilization.

The reason for Churchill: it is a busy port during 3 months of the year, from which much wheat is shipped to Europe—the shortest route from the Canadian plains to Europe in fact. About 40 steamers averaging 10,000 tons each load grain during the period from late July to the end of October.

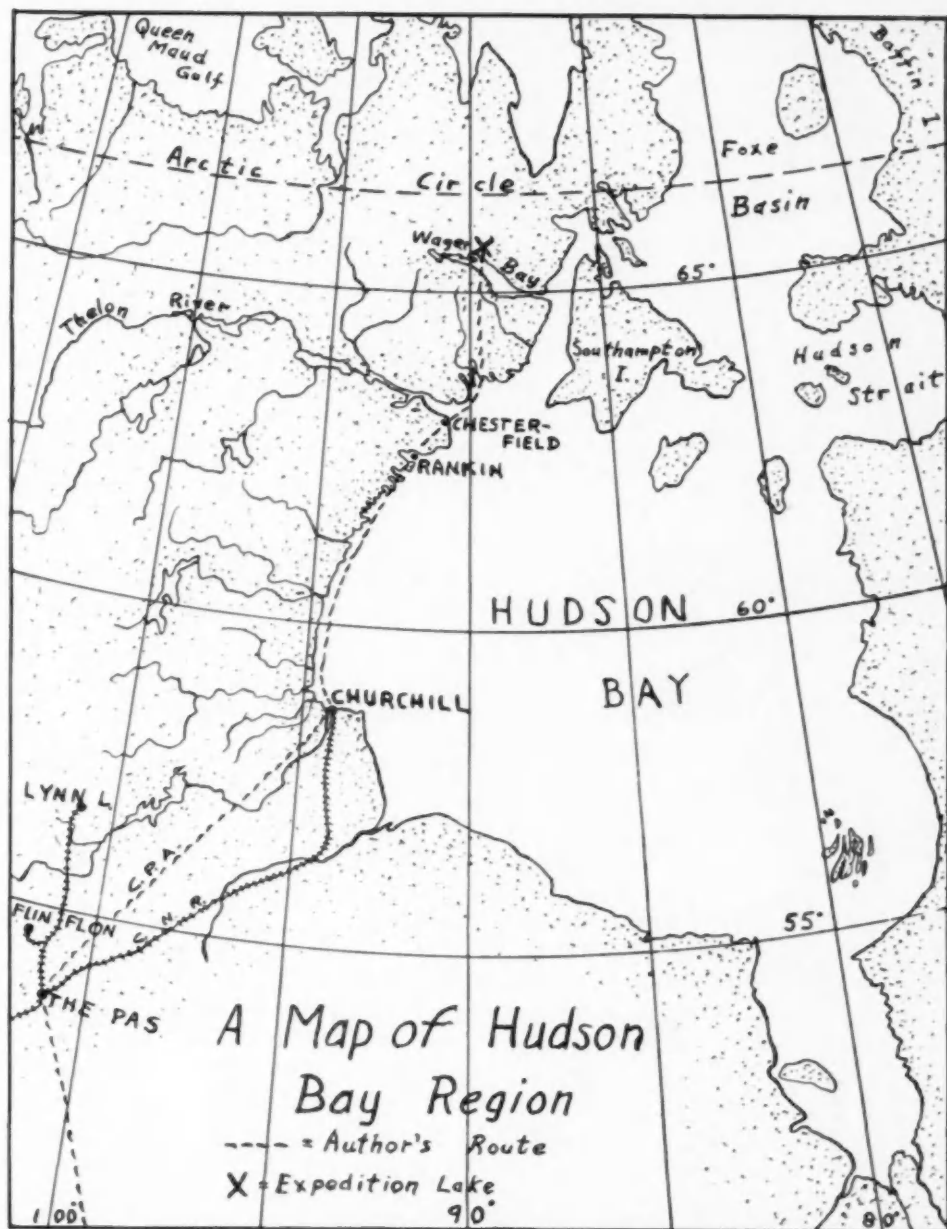
The ice breaks up suddenly: on June 17 it went out. The harbor and river were ice covered at noon—by supertime all the ice had disappeared. The ice on a stretch of water 2 miles wide and over 10 miles long had broken up and gone out with the tide into Hudson Bay in 2 or 3 hours; spring had come to Churchill! Next day we saw white whale (about 15 feet long) swimming out in the river. Actually, this break-up was about 2 weeks late; it usually happens during the first week in June.

(We returned to Churchill about July 20. Now it was mid-summer; all trace of ice was gone. Mosquitoes and giant "bulldog" flies made life miserable out of doors. A surprising amount of green had appeared in weeds, grassy fields and willow bushes which had not been apparent before. The temperature went up to 80°, a heat wave in Churchill.)

The following Monday dawned bright and clear; we were all packed and ready to leave for the north in our chartered plane. After a long disappointing postponement, we were again all keyed up. "Relax, fellows, we'd better wait awhile," greeted our

pilot. "I want to hear more about the weather to the north." By noon, ominous clouds had appeared and by nightfall a gale was in progress. The resulting storm lasted all week with rain, fog, high winds and temperatures back to the 40's. We couldn't get back in the hotel and so spent a miserable 5 days bunking in an army

barracks, expecting to leave at any time. But storm centers characteristically stall over Hudson Bay for days at a time. It seemed like an anticlimax when our pilot called us out of bed late Saturday morning to say it was clear at last to the north, though it was still cloudy in Churchill. We packed up again and went out to Landing



Lake, a fresh water lake about 3 miles from Hudson Bay. This lake is perhaps 2 miles long and a mile wide. Here we packed our luggage into the plane, a Norseman pontoon plane, the original seats of which had been removed to facilitate freight carrying. We had about a ton of baggage: food, 2 tents, cots, bedrolls, 2 radios, and everything else we might need for the coming month, with 2 weeks' extra food in case our return plane was delayed. After the luggage was packed it looked as if there would be no room for us; but the pilot told us to "climb in on top and lie down on the baggage." Talk about sardines in a can! And then at last we were in the air headed northward into the Arctic!

The Norseman is a slow plane (about 90 miles an hour with heavy load) and since we had a strong headwind we were to be over 7 hours in the air as we flew the 550 miles along the west coast of Hudson Bay and finally inland to our destination (see map).

As we flew northward along the coast of Hudson Bay, blue water stretched away to the horizon to the east, with the retreating clouds of our 5 day storm behind us to the south. We saw hundreds of little white whales swimming around far below us. The coast line is very irregular with a wide boulder-strewn, muddy tidal flat up to one mile wide. The tide in the bay is over 15 feet and since the slope is very gentle these tidal flats are exceptionally wide. This strip was a weird pattern of yellows and browns merging into the greens and blues of the water like some fantastic modern painting. Back from the shore the "land" stretched to the western horizon. This "land" is actually more than half lakes, with swamp and muskeg in between. This land is all glacial drift deposited at the end of the ice age . . . no so very long ago!

We landed half way up the coast at Rankin Inlet to refuel. Here at last we saw rock—we were out of the muskeg country. At Rankin, a nickel mine is be-

ing started; the shaft is down 400 feet and a concentrating plant was being built during the summer of 1956. (North Rankin Nickel Mines, Ltd.) Here was feverish activity out in the wilderness, and here we saw our first Eskimos! They were driving bulldozers and small trucks and helping load empty oil drums on a barge beached high above the low tide level. Our plane taxied up into the small harbor; a couple of Eskimos came out in a canoe with outboard motor to take us ashore. Then they rolled 2 large drums of gasoline down the slope to the water's edge across the tidal mud flats and finally got them into their canoe and thus out to the plane. Our pilot carried with him a small pump to get the gasoline from the drums in the canoe up into the plane's wing tanks. It was a very interesting way to refuel! It gave us a chance to observe the hectic preparations around the Rankin mine, as the men were racing with time to get some buildings up before winter returned. Supplies of all kinds were stacked over the barren, rocky landscape: hundreds of oil drums, lumber, mining machinery, a great pile of bags to hold the eventual ore concentrates.

The presence of copper-nickel ore was noted here more than 20 years ago but development began only in the last 3 or 4 years. A rich, though perhaps small, ore body has been located. The ore is very similar to that at Sudbury in character; chalcopyrite, pyrrhotite, pentlandite in a dark-colored igneous rock—diabase or norite. Since it is right at sea level on Hudson Bay, heavy freight can be brought in during the 3 open water months and ore concentrates taken out. It is planned to continue mining all year, stock-piling the ore concentrates till summer. This operation illustrates the possibilities of mining in the Arctic. Once the property has been developed and the plant put in, operation can go ahead without too much difficulty. During the winter months, all transportation has to be by planes on skis, of course.

From Rankin, we flew across a low, broad peninsula and back to Hudson Bay over the little settlement of Chesterfield Inlet—some dozen whites and a few hundred Eskimos. The town has a government radio station, doctor, the RCMP (mounted police) and a large mission school and church. It is the supply center for a large Eskimo-inhabited wilderness west of Hudson Bay, at the mouth of the Thelon River.

Then we sighted Wager Bay. This bay is an inlet extending nearly 100 miles westward from Hudson Bay. The south shore is quite spectacular as steep mountains rise some 2,000 feet above the water, at times with sheer cliffs. We had been approaching Wager for some 50 miles over gradually rising land and we did not realize the land was high above sea level until it dropped away suddenly into the great inlet.



RANKIN INLET at low tide. A load of empty oil drums awaits high tide for transfer to freighter. Mine shaft in background.

From here north we soon left the coast and flew over rock country with many lakes and rivers. We could see great piles of broken rock, some the result of recent frost action, others left by the last glacier. The ground was brown in various shades from almost black to yellowish with only the slightest traces of green. And absolutely no sign of life anywhere. One felt as if he were flying over another planet. (Had we perhaps taken a rocket flight to the moon?)

The bay is very majestic; just water and rock, yet quite beautiful in its wild way with the many shadows cast by low sunlight. We crossed it many miles inland from Hudson Bay, where Wager is over 10 miles wide, and continued over the north shore with its rolling hills and mountains. Previously we had selected an inland lake about four miles long and a half mile wide from the Royal Canadian Air Force aerial photographs of the area.

Now our pilot circled this lake to inspect the landing possibilities. Deciding it looked safe for a landing he put us down about 8 P.M. I suppose we were the first white men ever to float upon the waters of this lake!

The plane taxied up to shore, we quickly unloaded and soon our pilot was again

aloft! Then we really began to feel lonely, abandoned as we were far from any humans or any sign of civilization at all. We were 3 men against the elements! The piles of boxes and duffle bags arranged haphazardly along the shore were reassuring, however, and we started to pitch camp.

(to be continued)

Club of the Month

Michigan Mineralogical Society—Past, Present & Future

by JOHN F. MIHELIC

TWO BRILLIANT MEN—A. N. Goddard and Fenton Combs, organized the Society at the Goddard home in 1935. The Goddard name is a noted one in science and in manufacture, but in A. N. Goddard, the two merged. Fenton Combs was one of the most versatile of men, a building superintendent of large institutions, an associate of university presidents, a leader in the Detroit Academy of Science, an avid mineral collector, and a precisionist in gem cutting. It is no wonder that the charter members were fired with a love for fine minerals and a knowledge of their scientific background; an appreciation for good display techniques, and zeal for the acquiring of all phases of lapidary skills.

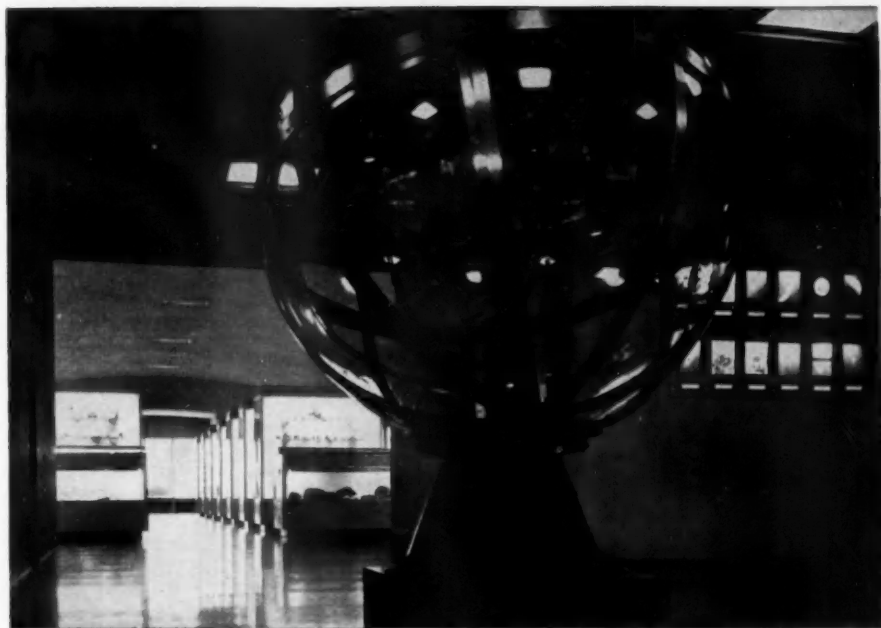
It is hard to estimate the value of meeting in the world famous Cranbrook Institute of Science, which is located in the wooded area of the Bloomfield Hills, near Detroit. Dr. Robert T. Hatt, the director, has played an important part in the Society's growth. The Society in turn, through individual donation and Society presentation has placed thousands of dollars worth of top quality gems and minerals in the Mineral Hall. Society members are among the trustees of the Institute. John Mihelcic initiated the lapidary classes at Cranbrook, and William E. Beresford, another mem-

ber, continued them. Dr. Leslie R. Bacon and James William Bay and others have contributed to the Institute's publications. Here is a fine example of two organizations working toward a common end.

Our Society has 350 members, a rather remarkable number, when one considers that some have to drive 50 miles of metropolitan traffic to get to Cranbrook. That fact alone eliminates insincere joiners. A cross section would indicate a considerable proportion of professional people, university and high school students, and skilled craftsmen. One third of the organization is feminine. The *Conglomerate*, the Society bulletin, began in 1940, and Lillian Mihelcic has been its editor since its inception. Other printed booklets, particularly "Collecting and Displaying Minerals" have found their way around the world.

Field trips of one to eight days are popular, and range from the Copper Country of Michigan to Bancroft, Ontario. We elect a board of directors to handle the business of the Society. Our meeting nights allow for an hour's inspection of the museum, visiting, getting books and magazines from our library, studying the theme of the educational display case for the meeting, and then an hour or two in the auditorium, to see and hear programs concerned with our interests. We have a series of open

houses, that we may learn from each other. Two or more classes a year are held at some high school in Detroit or at Wayne State University. These are taught by Wayne professors or other qualified members. Wayne State University was the re-



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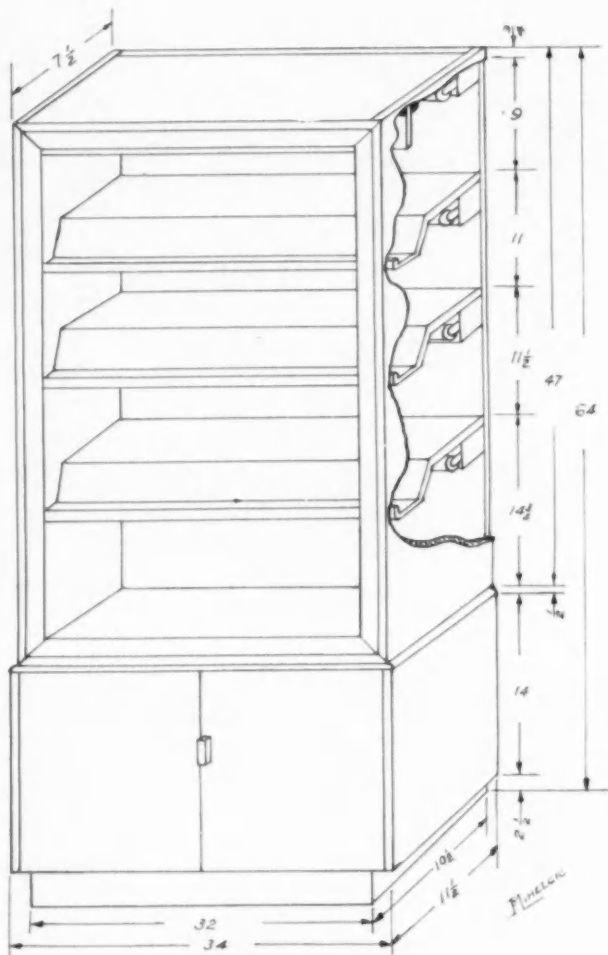


CRANBROOK INSTITUTE OF SCIENCE.

ipient of the valuable Goddard collection. The Society also donated a 123 carat Chatham emerald specimen to Wayne.

while presenting highly original displays of the first rank.

The strength of the Society lies in the



DESIGN FOR MINERAL CABINET.—(The activities of the members of the Michigan Mineralogical Society are varied and resourceful, and many of them have come up with ideas and methods which often have been of great value to the commonweal. One such contribution is the excellent design for a mineral cabinet which has much to recommend it, detailed drawing for which, made by John Mihelcic, is shown above.)

The Society has been closely associated with the Midwest Federation and has sponsored two conventions. Individual members have carried displays to distant conventions, preferring to forego competing for prizes,

friendly and unselfish cooperation of the members with each other. There are neither ivory towers nor tenements. This same cooperative character led the Society to align itself with others to sponsor a De-

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troit Museum of Science, to assist in Boy and Girl Scout ventures, and to lend aid to schools and community clubs. The future of the Society promises to fulfill an even greater participation in civic affairs, in co-operating with the Cranbrook Institute of

Science and in promoting a constantly improving knowledge of earth science among its members. This is the policy being followed by our well informed president, Arthur Y. Johnstone.

Basic Principles of Rockology

III.

by WILLIAM H. ALLAWAY

THE THIRD great class of rocks, which completes the cycle of rock building and gives us a picture of the most common rocks we find scattered over the earth's surface today, are called the METAMORPHIC rocks. These are rocks which were originally igneous, then sedimentary and finally altered or metamorphosed.

Metamorphism is a process which causes alterations in the chemical composition of minerals and in the texture or structure

of rock masses. Here then in the study of metamorphic rocks is a good opportunity for one to exercise his ingenuity, powers of observation, and imagination in diagnosing the genesis of rocks he may suspect to be metamorphic in character.

It is possible for so many things to have happened through past ages, the evidence of which has been almost entirely removed by the processes of change, that rocks must be of a pretty definite character to lend themselves to the interpretation of the amateur petrologist. So, considering the possibilities of a complete change in the component minerals, in crystallization and in structure, we have a puzzle that often seems to attract the inquisitive mind, and sometimes baffles even the experts as well as amateurs.

Even as the alchemist labored day and night in ancient times to alter the physical properties of baser metals into gold, the forces of nature today, deep down beneath the earth's surface, through the agencies of heat, pressure and moisture, and the rearrangement of elements, have indeed gradually altered many of the rocks. In this it seems nature has been more successful than man, because time was no element and there has always been plenty of it for repeated cycles of mountain building wherein erosion and deposition, heating, grinding, mixing, sifting, compacting and



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re-cementing of the rocks may take place.

By these processes nature has often converted limestone into marble, cemented sandstone, flint and chert into a solid mass to become quartzite. Shale has been changed to slate, and granite to gneiss or mica schist, etc. Other rocks have also been so altered that original forms, such as sedimentary rocks containing fossils, are no longer identifiable, and the more brittle granites and other igneous rocks develop bands of the tougher materials such as the micas which become

found areas that will reward the searcher with beautiful specimens of conglomerate built up of red and purple quartzite pebbles. The original rock from which these pebbles were formed probably came from the earliest mountains in that area, which were in existence in pre-Huronian times (over a billion years ago). In order to arrive at some understanding of the processes of metamorphism it will be necessary for one to study something of the geologic contortions that took place as nature went about the business of forming such altered rocks. If you have studied



"THE ALCHEMIST LABORED DAY AND NIGHT"

cemented together and more densely compacted.

We now find great areas of the earth's surface covered with metamorphic rocks that were once deep in the earth's crust. These have been uplifted by the forces of nature and their sedimentary covering removed by erosion, plainly revealing some of the events that took place in some cases over periods of time exceeding a billion years.

Adjacent to the eroded remnants of the Baraboo Range in Wisconsin, which in their youth must have rivalled the Rockies, can now be

a map of North and South America carefully you will have noticed that there are great mountain chains along the coast lines. These mountains are wrinkles in the earth's surface that were formed along the coast lines where the heavier basalt rock of the ocean basin meets the lighter granitic rock of the continent or land mass and pushes them up sky-ward. The great pressure of the heavier rocks upon the lighter rocks, plus other factors, such as the earth's rotation, seems always to have caused earthquakes and volcanoes where ocean and land meet. Along the coast

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lines are the weakest parts of the earth's surface and great cracks or faults are here formed.

During these mountain building episodes where tremendous pressures, weight and heat are applied to the crumpled surface of the land, the layers of sedimentary rocks are so contorted and twisted that the strata are sometimes even standing on end or at high angles and in folds. During these periods release of pressure and the



"ROCKS THAT YOU HAVE GATHERED"

breaking of the surface rocks often generates volcanic magma and the hot lava thus pouring over the surface rocks contributed to their alteration.

Some of the rocks thus affected show or indi-

cate little or no change in chemical composition, except possibly the loss of water or carbon dioxide. These then are the metamorphic rocks formed by contact or thermal process (changed temperature) and/or pressure and weight of rocks at great depths, and heat and stress due to mountain folding.

Other rocks were altered by the introduction of new material into their composition called metasomatism (enrichment of rock by new substance), for example, conversion of limestone to siliceous chert or production of tourmaline, etc.

It should now be stated that there are two types of metamorphic rocks: igneous metamorphic and sedimentary metamorphic. These types are not always easy to distinguish since an igneous formation may be eroded, then forming a layer of sedimentary rock such as sandstone, and this formation may be then altered to quartzite by cementation. This quartzite might be difficult to distinguish from fine grained igneous rock that has been altered directly to metamorphic rock without the intermediate step of erosion and sedimentation. There are innumerable examples of such possibilities and when encountered the area of occurrence must be known and studied in order to avoid the possibility of wrong identification.

Let us now proceed to a description of some of the more common metamorphic rocks which you may find in almost any glacial deposit or mountainous region.

QUARTZITE is a rock which was formerly sandstone, chert or flint. It is very hard and compact and can be distinguished from sandstone when broken, as the break will occur through the grains and not around them. This type of rock can be found in many colors from translucent white to very dark purple as it often occurs at Devil's Lake, Wis. The great earthen dam at Ogalala, Neb., called the Kingsley dam, which is three miles across, is rip-rapped (paved) its entire length with beautiful quartzite stones of many colors, from white to almost black and also with many beautiful shades of pink. Quartzite has a somewhat waxy appearance and is frequently banded. Inclusions of metallic hematite are not unusual.

Since there are many degrees of metamorphism, some of the quartzite lacks the characteristics generally attributed to the typical specimen; however, when broken, the edges are very sharp and the fracture is conchoidal or shell-shaped. It can easily be confused with fine textured granitics, either felsite or rhyolite, especially if the specimen does not have a vitreous luster.

GNEISS: In the Bear Lake region of Colorado in Rocky Mountain National Park are strewn great boulders which are remnants of the glaciers that covered this area during the great ice age. These boulders are of metamorphic granite called gneiss and are characteristically banded in appearance as the result of the tremendous heat and pressure being brought to bear on them. They differ from the mica schists in that they are much harder since more of the silica (quartz), feldspar and heavier minerals have withstood the squeezing process or were unable to escape and

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were re-fused (re-cemented) as part of the original rock.

This banding is in pink, white and black streaks running in parallel layers throughout the rocks.

Even the smaller stones are miniature replicas of the large boulders and when cut and polished show attractive patterns in flat layers.

MICA SCHIST was formerly a fine grained granite called felsite or tuff that has been pressed or squeezed until the material is transformed into layers like the layers in a slice of bacon. Only the toughest material survives in this process and the tabular mica crystal seems to be the mineral that resists this pressure the most effectively, so it usually predominates over the other material in mica schist. Other minerals frequently form in the schist layers, such as garnets and staurolites, as a result of pockets or aureolas of unusual minerals present in the original rock, which were completely altered by heat and pressure during the metamorphic process. Mica schists occur in great layers and are mostly dark in appearance, since the elements iron and magnesium seem to survive the changing process better than the lighter colored minerals in the rocks.

These rocks can always be identified by holding them up to a reflected light where the rows and layers of tiny flakes of mica can be observed.

MARBLE is probably one of the most commonly used rocks for building and decoration known. When highly polished its surface often discloses much of the included marine life such as crinoids and brachiopods that were present in the original limestone from which it was derived. Many of the so called marbles used in building trades are not truly metamorphic but are simply limestone sufficiently compacted so that they are easily polished, and are obtainable in large quantities. These marbles show much of the marine life, as they have not been subjected to the changes necessary to produce metamorphic marble.

A freshly broken piece of marble is sugary in appearance (due to the formation of tiny crystals), and sometimes very deceptive, since most people are so accustomed to seeing it as a polished surface. It occurs in about every color from white to black with many variegated shades and colors. The ordinary white marble is probably the most common. Many of the imported marbles with variegated colors can be obtained as samples or specimens by visiting a marble cutting works.

SLATE OR METAMORPHOSED SHALE is familiar to those of us who used slates or slate blackboards in our school days. This type of slate is a grayish black and has of course been processed so that it is flat and smooth, making it suitable to write upon with chalk. It also formerly was used largely for slate roofs. When broken, slate fractures in thin flat layers with splintery sharp edges. Although not very common, slate can be found that is bright yellow, red, green or white, depending on the color of the shale from which it was formed, and possibly upon its exposure to intense heat.

PHYLLITE is a somewhat softer type of rock containing a high percentage of finely divided

mica or chlorite and can be considered as intermediate between mica-schist and slate.

TALC, SERPENTINE AND SOAPSTONE are metamorphic products of weathering of siliceous magnesian rocks. They are mostly very soft in character and are used for carving, as they can later be hardened by a firing process.

As you may surmise there are many other varieties of less common metamorphic rocks which should be studied as the opportunity presents itself, but for the present purpose of introducing beginners to the metamorphic series of rocks, we believe we have now provided sufficient detail. Further study can be made in such books as Dana's "Textbook of Mineralogy." In succeeding issues it is our intention to keep our articles as simple as possible but especially instructive to beginners.

Now that we have reviewed the *three basic types of rock** we will later branch out into such subjects as iron and copper and other metals which are rock-forming minerals, and perhaps such subjects as magnetism and other topics of interest to our EARTH SCIENCE readers, likewise will be treated in this same simple manner.

* Igneous (March-April), Aqueous (May-June), Metamorphic (July-August).

Midwest Club News

BERNICE REXIN, *Club Editor*

3934 North Sherman Blvd.

Milwaukee 16, Wisconsin

CENTRAL MICHIGAN LAPIDARY AND MINERAL SOCIETY was formally organized last May. At a meeting held prior to the group's official organization, it heard Mrs. Ruth Kirkby, of Riverside, Calif., give an illustrated lecture on "Earth Science." She also displayed rare fossil specimens, and handmade jewelry created by her son, Noel. Mrs. Kirkby, who is a special advisor to the Riverside Museum and a popular lecturer, was sponsored on this occasion by the Michigan Gem and Mineral Society and the Michigan State University's geology department.

INDIANA GEOLOGY AND GEM SOCIETY on June 14 viewed "Our Mr. Sun," a superb hour-long film provided by the Bell Telephone Co. An additional highlight of the meeting was a special display of lapidary work and tools by the lapidary section of IG&GS.

EARTH CLUB OF NORTHERN ILLINOIS' program for June 14 featured two color movies, "Petrified River" and "American Frontier." The first film traces the geologic formation of uranium deposits back 200,000,000 years; covers modern methods of prospecting and mining uranium, and explains the formation and use of isotopes at Oak Ridge. The second movie, "American Frontier," is an historical record of the discovery of oil in the great Williston Basin of North Dakota and Montana, demonstrates modern pioneering methods in the search for new oil resources, and warns of hazards connected with them.

(Continued on page 30)

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(Continued from page 26)

CENTRAL IOWA MINERAL SOCIETY held a combined potluck dinner and auction on June 7. Minerals, tools, books and other items relating to the rockhound hobby were contributed for the auction by CIMS members. Gem and mineral dealers were also permitted to sell their products at the meeting, provided they donated 10 per cent of their receipts to the club's treasury.

CINCINNATI MINERAL SOCIETY on April 24 was addressed by Dr. James Bever, assistant professor of geology at Miami University, Oxford, Ohio. Dr. Bever discussed the criteria and basic requirements of a gem and the characteristics of semi-precious and synthetic stones. The commercial implications and aspects of the three classes were brought out. A lively discussion followed Dr. Bever's presentation of "Gems." To illustrate his points, Dr. Bever displayed a number of fine specimens, including a perfect diamond octahedron which weighed two carats.

CHICAGO ROCKS AND MINERALS SOCIETY on May 11 heard member Edward Rushton speak on "Copper Collecting in Arizona." Mr. Rushton also gave a brief résumé of his trip to Europe last year during which he visited mines in several countries.

WISCONSIN GEOLOGICAL SOCIETY is making plans for its annual exhibit in August at the Wisconsin State Fair. The club's displays have always been very popular with Fair visitors and have gained many new members for WGS.

EVANSVILLE LAPIDARY SOCIETY held an exhibit of gems and jewelry in the Evansville Central Library in April. The beautiful display received many compliments and the club received many applications for membership.

NEBRASKA MINERAL AND GEM CLUB at its annual dinner meeting was addressed by Dr. C. Bertrand Schultz, director of the Nebraska State Museum. Dr. Schultz, speaking on "Meteorites," discussed the different types of meteorites and some of the features by which they might be recognized, and compared them with certain terrestrial stones and irons which are easily mistaken for meteorites. He ran a short motion picture which showed the highlights in the removal of the giant stony meteorite which fell in southwestern Nebraska in 1949. This meteorite was discovered by a farmer who came near bogging down his harvester machine in the deep hole drilled in the field by the falling stone. Since no hole had been there when the field was plowed and seeded, the farmer was puzzled and considered several explanations as to the cause of the deep pit. Finally the possibility of a meteorite was suggested, and the stone, which

was found some eleven feet below the surface, proved to have come from outer space. Dr. Schultz had with him a piece of that meteorite, which he permitted his audience to handle.

CHICAGO LAPIDARY CLUB recently was shown pictures of famous jewelry pieces, many of which were created for the late Mrs. Rockefeller McCormick, by Fred Minuth, professional jewelry designer. Mr. Minuth described in detail the composition and design of each piece of jewelry pictured.

AUSTIN GEM AND MINERAL SOCIETY's regular meetings include a lapidary instruction period. Member Ted Thorson, who conducts the course, covered "The Operation of a Diamond Saw" at his last session.

ST. LOUIS GEM AND MINERAL SOCIETY recently heard Mr. Paul Davis speak on "Gem Engraving Through the Ages." His talk was illustrated with colored slides and a display of ancient jewelry from the collection of Sir Arthur Evans. Mr. Davis, who is a member of the SLG&MS' board, has collected Greco-Roman and Italian carvings for many years.

MINNESOTA MINERAL CLUB has planned an active summer for its members. On July 14 the group will hunt for agates at a good site near the Twin Cities; it will travel to River Falls, Wis., for club picnic on August 11, and on Labor Day week-end arrangements have been made for members of MMC to make a two-day trip along the north shore of Lake Superior.

MIAMI VALLEY MINERAL & GEM CLUB recently heard Dr. Paul White, assistant professor of geology at Antioch College, give an illustrated lecture on "Geology." Currently Dr. White is studying the composition of Canadian rocks; some of them are believed to be more than a billion years old.

CENTRAL ILLINOIS ROCKHOUNDS made a recent field trip to Lawrenceville, Lawrence County, Illinois to study the geology of that area. Lawrenceville is in the valley of the Little Wabash River and was one of the principal outlets of glacial meltwater during the Wisconsin stage of glaciation. Beneath the valley's glacial sands and gravels, lies the bedrock of the Pennsylvanian age from which coal is mined. Ranking second among Illinois' oil producing counties, Lawrence County has produced more than 270,000,000 barrels of oil since 1905.

MINERALOGICAL SOCIETY OF PENNSYLVANIA as a guest of the Bethlehem Steel Company on June 9 toured the Cornwall Iron Mines, Corn-

wall, Pennsylvania. The Cornwall mine during the American Revolution supplied ore to the charcoal furnaces which made cannon and ammunition for George Washington and his continental armies. The original Cornwall charcoal furnace, built in 1792, is still in excellent repair and is now a State owned museum. Open pit mining at Cornwall ceased in 1953 after reaching a depth of 400 feet. Today all its mining is underground and serviced by shafts extending as far as 1,225 feet below the surface. Minerals found in the mine are magnetite, hematite, andradite garnet, covellite, pyrite, chalcophyrite and tremolite. MSP members were permitted to collect minerals from the dumps.

*

RECOMMENDED READINGS

"On the Trail of Ancient Men," by Harry Zollars, May issue of *The Voice*. Mr. Zollars pin points locations near El Paso, Texas, where thousands of fine Indian artifacts have been collected. These include metates, arrow points, beads and bowls.

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